Reinforcement corrosion-resisting characteristics of silica-fume blended-cement concrete

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Abstract: Reinforcement corrosion-resisting characteristics of four plain and eight silica-fume blended cements have been evaluated using an accelerated corrosion monitoring technique. The four plain cements had C3A contents of 2, 9, 11, and 14 percent to evaluate the effects of C3A factor on corrosion-resistance characteristics of plain cements. Eight blended cements were formulated in a manner that each of the four plain C3A cements had 10 and 20 percent cement replacements by silica fume. Results of accelerated corrosion monitoring tests show that the time to initiation of corrosion of reinforcement is significantly influenced by the C3A content of the cement. The 9, 11, and 14 percent C3A cements performed respectively 1.75, 1.93, and 2.45 times better than the 2 percent C3A cement. Silica-fume blending of plain cements by 10 and 20 percent partial replacement very significantly improves corrosion-resistance performance in terms of corrosion initiation time. On an average, 10 and 20 percent silica-fume blended cements respectively perform 3.45 and 3.75 times better than the parent plain cements. Corrosion resistance of 9, 11, and 14 percent C3A cements blended with 10 percent silica fume was found to be 5.12, 7.35, and 7.39 times better compared to the performance of Type V 2 percent C3A plain cement commonly used in the Middle East and in marine environments. Hardly any tangible advantage was observed in terms of corrosion initiation time by increasing silica fume from 10 to 20 percent as cement replacement. The beneficial C3A-chloride complexing effect was found to be operative in blended cements also, although on a reduced scale compared to plain cements.